UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SUMMARY REVIEW OF MONTHLY REPORTS[1]
FOR
SOIL CONSERVATION SERVICE--RESEARCH[2]
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EROSION CONTROL PRACTICES DIVISION

Lubbock, Tex., Dust Bowl - H. H. Finnell, Goodwell, Okla.

"In an area of about seven counties west and south of Lubbock, Tex., we have had a new 'Dust Bowl' for the past 7 years. The erosion damages to lands, commerce, and transportation have been the equal in intensity, though not felt over as large an area, as during the 1930's in the five-State area to the north. The abandonment of lands due to erosion damages has been going on recently as it did during the 1930's, but abandonment due to fright and financial distress which took place during the 1930's is not current. The continuation of general prosperity accounts for this difference in response to soil erosion hazards.

"As indicated by previous experience we find that the deep sands have endured cultivation the shortest length of time before becoming unmanageable. The Lubbock Dust Bowl consists mainly of deep sands and sand-hill areas used for rowcrop production.

"Approximately 2,000,000 acres of other marginal type soils broken from the native sod during World War II are strung out along the arid margins of the Southern High Plains northward in Texas, N. Mex., Oklahoma, to Kansas and Colorado. Shallow soil hardlands and B class slopes predominate in these marginal wheatbelt areas.

"Experience of the first Dust Bowl causes us to expect a general breakdown of this marginal agriculture when the newness has worn off these low class lands. Threatening signs already have shown up along this new frontier.

"There are no known methods of keeping marginal soils safely in cultivation under wind erosion hazards. The only remedy is the return of these lands to adapted perennial grasses for a grazing utilization. The thing we fear most is that a failing agriculture will be pursued to the bitter end of enforced abandonment on the low class lands.

"The rehabilitation will be much more expensive, both as to cost of operations and the waste of potential soil resources than it would be if conversion took place before the lands 'went wild.'"

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[2]All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

Soil Erosion Practices - D. D. Smith, Columbia, Mo.

Waterway Stabilization by Reed Canary Grass - "Waterway stabilization by reed canary grass was observed in six soil conservation districts during the last 2 months. Four waterways with excellent stands of the grass were seeded during the period 1934-39. Two waterways seeded in 1948-49 in the Lafayette District also have excellent stands of the grass. Several waterways were observed in which reed canary sprigs were spread and disked into the soil after processing by use of ensilage cutters or roto tiller. In all cases, very poor stands of the grass were in evidence. They were no better than the poorer stand secured by seeding. Hand processing and sprigging has resulted in practically 100 percent survival at McCredie.

Check Weights of Cattle on Grazing Areas - "First check weights of cattle on the grazing areas were made May 22. The two bromegrass pastures had produced 131 and 150 pounds per acre by that date. The first of these has Ladino clover, while the second receives nitrogen fertilizer spring and fall. The plot which receives nitrogen fertilizer was ready to graze a week earlier than the other area. Ladino clover was damaged by late winter freezing and thawing. Production on alta fescue and orchard grass was about 90 pounds, and from 100 to 125 pounds per acre on Kentucky bluegrass. Wheat had produced 122 pounds by May 22. Average daily gains per head for this early period of the grazing season were as follows:"

Bromegrass	3.25
Kentucky bluegrass	2.50
Alta fescue	2.00
Wheat	2.00
Orchard grass	1.75

Runoff from Grazed Pastures - O. W. Beale, Clemson, S. C.

"The runoff, soil and nutrient losses from grazed pastures during the first year since the plot installations have been summarized. The rainfall during this period, March 151 to March 1952, averaged 52.64 inches. The average runoff was 18.16 percent and soil loss was 550 pounds per acre. The highest runoff and soil loss occurred from the fescue-Sericea lespedeza pasture on the 8 percent slope of sandy clay loam and the lowest from fescue-Ladino clover on the 14 percent slope of sandy loam. However, soil losses were very low from all pastures.

"The average percent runoff for the period from the pastures was greater than that from clean-tilled continuous cornland without a winter cover crop. The slope of the clean-tilled cornland is 8 percent and runoff from March 1951 to March 1952 was 17.25 percent. However, the soil loss from the clean-tilled land was 8,006 pounds per acre, about 14 times that from the pastures.

"Most of the runoff, soil and nutrient losses from the pastures occurred in January, February, and March 1952, when the rainfall was more than 45 percent of the total annual rainfall. These data and the nutrient losses during these 3 months are given in table, copies of which can be obtained from the project. Runoff, soil, and nutrient losses during the preceding 9 months were negligible. The potash and phosphate losses are considerable and nitrogen losses are low, although a heavy rain of 3.5 inches, causing more than 60 percent runoff, occurred immediately after applications of ammonium nitrate."

Effect of Supplemental Irrigation on Runoff and Erosion - G. D. Brill, New Brunswick, N. J.

"We have a series of small 1/200-acre plots on the Vegetable Research Farm at New Brunswick where interrelationships of conservation rotations and supplemental irrigation are being studied. Sweet corn is grown continuously and in rotation with a clover-grass sod mixture which includes 2 years of corn and 1 year of sod, both with and without supplemental irrigation. Water is added when moisture tension reaches 20 inches of mercury as indicated by a tensiometer. Four applications of about 1.5 inches each were made during the 1951 season. On two occasions rain occurred shortly after the applications were made.

"Soil and water losses from these plots during the 1951 growing season are shown in table 1:

Table 1.--Effect of rotations and supplemental irrigation on runoff and erosion - 1951

Crop	Treatment	Not irrigated		Irrigated	
		Soil loss lbs./acre	Runoff inches	Soil loss lbs./acre	Runoff inches
Sweet corn	Continuous cultivation	390	0.35	730	0.98
Sweet corn	3-yr. rotation sod '49	280	.28	320	.64
Sweet corn	3-yr. rotation sod '50	120	.13	270	.52
Grass-legume sod	3-yr. rotation sod '51	0	0	0	0

"As in previous years, the value of a rotation in conserving soil and water is clearly shown. Soil and water losses from sweet corn in rotation were considerably lower than continuous sweet corn both with and without supplemental irrigation. Runoff and erosion were higher in all cases from the irrigated areas."

Effects of Seedbeds and Crop Cultivation on Soil Physical Properties and on Crop Yields - G. R. Blake, New Brunswick, N. J.

"With modern machinery there is a tendency to prepare seedbeds and to cultivate crops more intensively than was previously possible. Several experiments were set up in 1951 to study the effects of this intensive cultivation on soil physical properties and on crop yields. Some of these were reported last month in the project report, copy of which can be obtained from the project if so desired. Results from other field plots are reported here.

"Triplicate plots receiving minimum seedbed preparation and cultivation were compared with triplicates in which the seedbed was worked thoroughly and which received extra cultivation. Sweet corn was grown on all plots with identical

fertilizer applications. Soil physical properties and yields are shown in table 1. All soil samples are from the 2- to 5-inch depth.

Table 1.—Influence of cultivation intensity on soil physical properties and on yields of sweet corn

	Minimum tillage		Maximum tillage	
	Furrow	Row	Furrow	Row
Air space %	29.7	35.7	24.6	31.9
Volume weight	1.27	1.16	1.37	1.28
Aggregation %	72.2	74.5	68.2	71.9
Yields (#1 ears/A.)	21,540		20,380	
Relative yields	100.0		94.5	

"This is the first year of operation of these plots. The grass-legume crop for several years previously had presumably left the soil in good structure. Wider differences in physical properties and yields would be expected as the study continues. Table 1 shows, however, that there were yield differences of 5.5 percent even in this first year. Considerable differences in air space, volume weight, and aggregation were found in the corn row as well as in the furrow."

Over-all Average Daily Cattle Gains - R. M. Smith, Temple, Tex.

"Over-all average daily cattle gains were 1.86 pounds per head per day. Small grain grazing was completed on May 29, and the 104 steers were put on permanent pasture and on sweet sudan, with 5 head continuing on native grass meadow. Total steer gains per acre from small grain this season range from 198 to 357 pounds on several different fields. The highest gains were obtained where early and late oats were cross seeded at a total rate of 3 bushels per acre. Clover stands are now being compared. Oats harvested for hay gave yields between 1 and 2 tons per acre, following steer gains of from 65 to 100 pounds per acre from winter grazing. Grain harvesting is now well under way. Clover established in barley that was completely grazed off has made more growth and the stands appear better than in barley cut for grain, or in most of the oat fields. Prospects are good for considerable clover grazing during July."

Legumes -C. J. Whitfield, Amarillo, Tex.

"On May 5 and 6, several varieties of legumes were planted on the station to test their adaptation for possible use in crop rotations for the area. The varieties planted were Ladak alfalfa, Pilca Butta alfalfa, guar, Madrid clover, hubam clover, and common yellow blossom sweet clover. Rain fell the day following planting and a crust formed on the soil surface which prevented some of the plants from emerging. Both varieties of alfalfa came up to a good stand. The stands of clover are very poor with the exception of the Madrid which is probably good enough to leave. Only a few plants of the guar came up and it will be necessary to replant the guar, hubam clover, and common yellow blossom sweet clover. Possibly it was a little early to plant guar since this plant likes warm weather."

Clay Soil Studies - O. K. Barnes, Laramie, Wyo.

"In all instances studied this season on the clay soils, the plots show a marked and consistently higher water-intake rate on the better covered areas. On the shallow clay soil, approximately 2-1/4 inches of water was taken in on plots with 80 percent of the ground covered; with 60 percent cover the intake rate averaged 1-1/2 inches and with about 30 percent cover, the intake rate for 60 minutes amounted to approximately 1 inch. At another location on a deeper clay soil, it was found that on ungrazed range that is occasionally cut for hay, test plots with approximately 100 percent cover showed an intake rate of 1.8 inches in 60 minutes as compared with plots across the fence on heavily grazed range with 60 percent cover and an intake rate of approximately 1 inch in 60 minutes. Other plots at this location with 85 percent cover averaged 1.3 inches of water in during the 60-minute run.

"The preliminary summary of the data collected on the clay soils indicate that during the first 30 minutes of the hour run, the intake rate varies less with cover differences than does the intake rate during the second 30 minutes. Intake rates during the second 30 minutes vary several hundred percent between good and poor cover. Some data have been collected on intake rates up to 90 minutes and have shown little variation with the second 30-minute period.

"The greatest difference in water-intake rates measured so far was on a relic area and adjacent heavily grazed pasture (plots 96-100). At this location the intake rate was practically equal to the rate of application, 3 inches per hour; whereas, just across the fence on heavily grazed range, the intake rate averaged less than 1 inch during the hour."

Sugarcane Experiments - J. Vicente-Chandler, Rio Piedras, Puerto Rico

"Some interesting results are becoming apparent in the experiment to test several methods of planting sugarcane experiments so that it will not interfere with the flow of irrigation water in the furrows. Plots approximately 1/2 acre in size are being used in this study. Germination was highest with the cuttings planted in very low ridges. Germination was about the same where the cane was planted in very shallow furrows on level land. These are being used for the first few irrigations. Later, larger furrows will be built between rows for permanent irrigation. The seed pieces planted in two rows near the edges of flat wide ridges had the third highest germination followed closely by those planted in the bottom of deep furrows, the standard practice at Aguirre. The other methods tried have been discarded because of very low germination."

Infiltration Measurements - G. M. Horner, Pullman, Wash.

"Infiltration measurements were made by the use of the infiltrometer on several of the control plots. In general, the infiltration rates obtained at this season were greater than those found during mid-winter from natural rainfall. This was particularly the case for the first 2 or 3 hours of water application. After a certain time of water application, the infiltration rates decreased to about 0.05 inch per hour on sites located on the middle of south slopes. This result occurred on stubble-mulched land that has shown a much greater infiltration rate during mid-winter storms. A slowly permeable horizon in the subsoil was apparently the zone that limited the intake of water at the surface after the soil had become saturated. Winter precipitation is usually of insufficient amount over a

short period to cause such a saturated condition on most sites. It is planned to study this condition in more detail on sites representing different soil-profile characteristics."

Krilium and Ultra-Wet Tests - F. W. Schaller, Ames, Iowa

"In cooperation with Soil Physics, a procedure and plan was prepared for testing Krilium and Ultra-Wet in the establishment of vegetation in gullies. This plan and sufficient material were sent to Mr. E. E. Smith, District Conservationist at Chariton, Iowa. The soil conditioners are to be applied to gully sites in Clark, Lucas, Wayne, and Decatur Counties. Ultra-Wet was also sent to George Harmon for inclusion with his tests in the Little Sioux area. More material will be sent out for fall application in the same and other areas.

"The old lysimeter plot set-up at Clarinda has been renovated and is now being used for a study with Ultra-Wet. Under the supervision of Dr. Don Kirkham in Soil Physics a study is being conducted to determine the effect of Ultra-Wet on water percolation. Also, the rapidity with which this chemical is leached from the soil will be determined."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio

"Although precipitation of 4.08 inches was more than normal for the month, and 5-minute rainfall intensity reached nearly 4 inches per hour, there was practically no surface runoff from any of the watersheds.

"Soil and water conservation studies on corn areas for 1952 are listed below:

Watershed No.	Treatment
106	Conventional, prevailing practice, straight row
121	Conventional conservation practice, contour
188	Mulch culture (skim plowing and loosening sweeps 8 inches deep)
191	Conventional plowing with 1,000 pounds Krilium per acre mixed to a depth of 4 inches by disking, contour cultivation.
-	Disked sod for mulch-corn culture.
-	Same as that for No. 191 plus subsoiling to depth of 14 inches with Krilium also applied to subsoil for stabilizing structure.
-	Same as No. 188 except mulch material raked from corn rows before planting and left in area between rows.
-	Same as above except double mulch material replaced on

Watershed No.	Treatment
	planter rows after planting.
-	Same as No. 121 plus 8-ton manure mulch applied after corn planting.
-	Same as No. 121 plus chopped hay blown on surface for mulch.
-	Skip row plan: Plowing strip four and six 14-inch furrows wide with small sod strip intervening. Two corn rows planted in each plowed strip - doubling planting and fertilizer rates.

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Tex.

"The storm of May 23 was the only one with high rates. During this storm 2.12 inches rain fell during the period from 7:00 to 9:00 p. m. This storm caused runoff at all runoff measuring stations except SW-12 (an area of 3 acres with native grass cover that has never been plowed). Computations on this storm are not yet completed for all stations. The following runoff amounts have been computed:

Area No.	Size in acres	Treatment	% Pasture and meadow	Total runoff inches
W-1	170	Ordinary practices	17.9	0.540
W-2	130	Ordinary practices	30.6	.417
Y-2	132	Conservation practices	31.9	.325

"Runoff was heavy with considerable erosion from land planted to cotton, moderate from corn and sorghum, light from areas where oats were ripening, and light or negligible from grassland areas.

"Favorable moisture conditions continued through the month. Both areas with and without conservation practices had optimum moisture for crop growth. However, the percentages of moisture from samples taken on May 21, were consistently higher at all sample depths on the conservation-treated area. The percentages at the designated depths were as follows:

Conservation practices - Y area: 0-6 inches, 29.9 percent; 6-12 inches, 28.8 percent; 12-24 inches, 28.9 percent; 24-36 inches, 27.5 percent; 36-48 inches, 27.9 percent; and 48-60 inches, 26.8 percent.

Ordinary practices - W Area: 0-6 inches, 28.3 percent; 6-12 inches, 26.5 percent; 12-24 inches, 25.6 percent; 24-36 inches, 25.8 percent; 36-48 inches, 26.4 percent; and 48-60 inches, 25.7 percent.

"Oats are being harvested. The highest yield thus far has been 65 bushels per acre. Corn is tasseling. Grain sorghum is in the bloom stage. Sweet Sudan planted on April 1, is ready to be grazed. Second year Madrid sweet clover is in full bloom and looks as if it would set a seed crop. A good stand of cotton was obtained on all areas. Thrip damage has been unusually heavy this season. Control measures are being applied. Pasture areas are in excellent condition for the first time in 2 years."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebr.

"Precipitation in May was about a quarter of an inch below the long-time average and measured 3.14 inches at the meteorological station. The largest storm occurred on May 21 and lasted less than an hour. The meteorological station gage showed that about 0.75 inch of this rain fell in a 10-minute period.

"On May 8 a team of four men consisting of two Regional Zone Technicians, the Assistant State Conservationist and the D. C. of this district, inspected the progress on our 411-acre partially treated watershed. This inspection was requested by the Project Supervisor through the Regional Research Coordinator who arranged the tour to evaluate and reappraise the conservation progress on this watershed. Needless to say, the wide experience and training represented by this group and their desire to improve and offer constructive criticism is considered to be of a great deal of further value to the program. One suggestion which all agreed on was the immediate furrowing of three waterways where considerable small gullies had developed. Another suggestion was the grooving of a brome-pasture field in the area which showed evidence of over-grazing and considerable runoff.

"As a result of the inspection tour a pasture groover was constructed out of an old lister in accordance to previous design, however, the machine was materially improved by mounting the lister beam on our Dempster frame which is used in subtilling operations. The improvement machine provides additional weight, stability, and dispenses with a man to ride the lister. An almost perfect rectangular groove about 4 inches wide and to the desired depth of 4-1/2 to 5 inches resulted. The grooving of the three bell-shaped waterways consisting of about 8 acres and the 10- to 12-acre bromegrass pasture was groovedas recommended by the team on May 8. Additional suggestions for later consideration such as drops on several gullies, seeding of legumes, and additional terraces will be completed as soon as practical.

"Computations of the runoff for the storm of May 21 show the following:

Table 1.--Average peak rates of runoff in inches/hour from approximate 4-acre watersheds under different land use practices, storm of May 21, 1952

Practices	Corn	Oats	Wheat
	In/hr.	In/hr.	In/hr.
Straight row	1.60	1.80	2.24
Contoured	.03	1.70	1.87
Subtilled	.52	1.22	1.50

"The native grass meadow showed an average peak rate of 0.22 inch per hour and the moderately heavily grazed pasture 1.19 inches per hour.

"Rainfall for the storm of May 21 showed considerable variation over the area. Watershed W-3 untreated, containing 481 acres received a Theisen Weighted Rainfall of 1.23 inches of which 0.38 inch ran off. It reached a peak of 0.50 inch per hour. Watershed W-5, partially treated, 411-acre watershed with 68 percent of the planned terraces completed received a weighted rainfall of 0.95 inch, of this amount only 0.11 inch ran off and the peak rate of flow was 0.10 inch per hour.

Hydrologic Studies - R. E. Hickok, Lafayette, Ind.

Erosion Losses - "The manuscript 'Selective Loss of Soil Nutrients by Erosion,' by N. L. Stoltenberg of our staff, and Dr. J. L. White of the Purdue Agronomy Staff, has been completed and submitted for station approval for publication. Material from this paper has been discussed by Mr. Stoltenberg in our monthly reports, beginning last January and continuing with the following:

"Two important principles which affect the erosion process are represented in figure 2, copy of which can be obtained from the project. (Figure 1 entitled 'Nitrogen Content of Eroded Material in Runoff' which has been mentioned in previous discussions can also be obtained from the project.) As would be expected, good correlation was found between the nitrogen and organic-matter content of the eroded material. However, if the eroded material had the same composition as the surface soil, the data points would be grouped around the intersection of the lines indicating the N and O. M. content of the soil. All samples falling in the first quadrant with respect to the intersection of these lines represent the effect of selective erosion in removing material of higher nutrient content than the existing soil.

"Samples of eroded material containing less organic matter than the surface soil (second quadrant), have been found to be associated with large amounts of erosion and may be rationally explained on the basis of the availability of various soil fractions to the runoff. According to this concept, runoff can only erode that material at or near the soil surface. As selective erosion progressively removes more of the fines from the surface, a point is finally reached where a 'pavement' of coarser material remains. The material subsequently eroded will therefore be low in fines and organic matter. It appears that under natural conditions this is one of the ways nature develops a protection against selective erosion.

"It appears that these two principles, i. e., selectivity and availability, would have general application. Thus, low rates of runoff over soils containing considerable quantities of coarser material would favor selective erosion and the development of an erosion 'pavement.' This 'pavement' would be disrupted, however, by cultivation, plowing, or rill development, with a temporary increase in the availability of the finer and more valuable soil constituents which would allow for further selective erosion. On the other hand, if the runoff rates are commonly high enough to remove the soil 'en masse,' the effects of these two principles will be minimized."

Soil-Moisture Consumption - "In response to a request by G. W. Musgrave for available information on the effect of conservation management practices on evapo-transpiration of soil moisture, H. A. Jongedyk has prepared the following brief report of estimates, based on limited soil-moisture studies on our experimental watersheds. It is interesting to note that there appears to be a very substantial increase in soil-moisture consumption on the conservation-treated watersheds, which supports the statement in our March report that the 9-inch

reduction of surface runoff during the 4-year crop rotation period resulting from the conservation-management system must have been largely off-set by the increased moisture requirements for the substantially increased crop yields:

"Soil-moisture measurements have been made, especially during the growing of 1950 and 1951, primarily to help analyze runoff results. It has also been desired to determine whether increased infiltration of water under conservation treatment is utilized. Unfortunately, in the past, measurements have been limited to gravimetric determinations and have not been too frequent. Estimations have been made, when possible, of evapo-transpiration. The amounts of evapo-transpiration represent net soil-moisture loss and are relatively low because of not including the moisture of diurnal condensation which may be substantial in this region.

Table 1.--Evapo-transpiration estimations, Experimental Watersheds, Purdue-Throckmorton Farm, Lafayette, Ind.

Period	Corn		Soybeans		Meadow		Remarks
	Conservation	Prevailing	Conservation	Prevailing	Conservation	Prevailing	
	Inches per day						
7/10-7/27 1951	0.21	0.15	0.13	0.16			
8/7-8/23 1951	.12	.06	.16	.12			
8/24-9/20 1951	.09	.09	.11	-			
7/21-7/31 1950	.23	.14	.18	.16	0.22	0.02	Hay cut in late June
7/31-8/19 1950	.17	.12	.13	.06	.17	.16	Higher level of soil moisture under meadow than corn

"Higher evapo-transpiration rates occur at the higher moisture levels of the soil and greater vegetative growth. Higher evapo-transpiration occurs under corn than soybeans early in the season, but not later. Early in the summer, evapo-transpiration may be greater under prevailing practices because higher evaporation may more than off-set lower rates of transpiration. Evapo-transpiration may be very low on meadow where there is a heavy mulch and little vegetation such as is found after grain is removed or hay is cut."

Hydrologic Studies - Geo. A. Crabb, Jr., East Lansing, Mich.

"Project personnel have long wondered if there was a possibility that kudzu might not be successfully utilized in controlling certain types of erosion in Michigan. Patient inquiry disclosed the fact that it was generally felt that this location is too far north for successful utilization of this erosion-control plant, but that in isolated instances kudzu had grown well in Michigan. Accordingly, through the cooperation of the Chief of the Regional Nursery Division, A. D. Slavin, 2,000 kudzu crowns were procured from the SCS Nursery at Elsberry, Mo., for trial planting. These were received May 8, and planted May 12. Three types of plantings were utilized: The primary planting was a field planting to correct a small wash in a field on the College farm on Beaumont Road, spot plantings on steep land adjacent to the barn-site of the College's Bennett Farm were made, and

spot plantings along the cultivated watershed fence-line were also made. The results of these plantings will be watched with interest.

Hydrologic Studies - T. W. Edminister, Blacksburg, Va.

"On the 14th and again on the 16th, Mr. Holtan reports, Messrs. Wilson and Harmon of the SCS Flood Control at Staunton, Va., were at this project. Mr. Holtan worked with them in flood routing the runoff above Waynesboro, Va., through several detention reservoirs to illustrate and anticipate flood reductions at Waynesboro. It appears that the five reservoirs planned would reduce the 50-year expectancy flood peak of approximately 21,000 cfs to about 17,000 cfs, a reduction of about 20 percent. Messrs. Wilson and Harman were to discuss these estimates with Regional Office personnel on the 20th.

"Mr. Holtan attended the D. C. School on irrigation at Chatham, Va., on May 22 to discuss principles and practices of farm-pond sealing. It was very pleasing to note the improved attitude of the fieldman toward pond-sealing practices. It appears that the efforts of R. C. Jones and W. A. Allaband are bearing fruit. The discussion of this subject was lively and constructive. Tentative plans were made to try to get a readily portable sheepsfoot roller available to various districts. Mr. Hodgson of the State Office was requested by the D. C.'s to find out if research could be undertaken toward development of a sheepsfoot compaction unit which could be easily transported and that could be drawn by farm tractors. Irrigation, among other things, is placing emphasis upon the farm pond as a source of heavy withdrawals of water. Obviously these ponds must be well designed to meet the purpose.

"Mr. Holtan discussed farm ponds as a source of irrigation water before the Irrigation Working Conference here at VPI on May 28. Animated discussions during the 2-day conference were very enlightening. Concerning farm ponds, it was pointed out that streams are often disease bearing and that especially in tobacco areas, irrigation will have to rely primarily upon ponds where the water can be treated and controlled to eliminate contagion of the crop. This will place more demands upon the farm pond. Pond designs will have to consider replenishment of water withdrawn. In many instances, irrigation systems are being designed for the full capacity of the pond. Such practice can only lead to disappointment. More information is needed on runoff yields such as the paper by M. H. Kirkpatrick entitled 'Dependability of Surface Runoff Supplies in the Ridges and Valleys Region of Virginia' which is still pending publication."

Hydraulic Studies - F. W. Blaisdell, Blacksburg, Va.

"Mr. Donnelly continued his tests on the straight drop spillway stilling basin. He has determined that the blocks should occupy from 50 to 60 percent of the basin width. He also found that the blocks should be $0.4\ d_c$ wide. Present indications are that the blocks will be $0.8\ d_c$ high, $0.4\ d_c$ wide and of sufficient length to satisfy structural requirements.

"A few tests were made where the drop was so low that the design tailwater elevation was above the crest of the spillway. These tests showed that the stilling basin was too short, for the jet would float out of the basin and attack the stream bed downstream from the end of the basin. Holes 4 feet or more in depth were scoured in the downstream channel. The basin length had been based on the location at which a free-falling nappe hit the basin floor. However when the nappe plunges below the tailwater surface, it is not free-falling and tends to float.

Therefore a new formula for the form of the nappe was developed which was based on the assumption that below the tailwater surface the nappe would continue at the same slope as it had attained when it entered the tailwater. Mr. Donnelly reports that this equation worked out very nicely when the design tailwater was used, but when more tailwater was used for the same basin design to simulate submerged flow conditions, the jet again floated out of the stilling basin and attacked the downstream channel bed. Even a slight increase in tailwater depth was sufficient to cause deep scour holes, and in some cases the scour-hole depth increased with the tailwater depth."

Hydraulic Studies - W. O. Ree, Stillwater, Okla.

"Testing was resumed on the head-discharge characteristics of the culverts equipped with weir sills. Previous tests were made without the culvert roof in place so that the water-surface profile could be measured. At certain intermediate discharge rates the sills formed a hydraulic jump which would have touched the culvert roof. For higher floors the jump disappeared and the depth of water was less than culvert depth. This brought up the question--would the culvert have flowed full if the roof was in place. This is being tested now.

"Inspection of the Kentucky 31 Fescue channel shows the cover to be excellent. General observation on this grass indicates that it will be a good channel lining. It provides a good cover for a large part of the year and seems to thrive under local conditions. Profiler sockets are being installed so flow tests can be made on this waterway.

"The paper 'The Use of Grass in Waterways,' was prepared for presentation at the Sixth International Grasslands Conference."

Drainage Studies - M. H. Gallatin, Homestead, Fla.

"Plots were laid out in quadruplicate to test the effectiveness of T. C. A. and C. M. U. in the control grasses and weeds in the shallow ditches used in this area. Two concentrations of CMU will be used 30 and 40 pounds per acre and 75 and 100 poundsper acre of the TCA.

"Plots were also laid out in the pothole where Ammate will be applied to walked-down material and standing to try the effectiveness of this material in killing brush growth as willow bay, rubber, and other trees. A mixture of both material CMU and Amate will be applied in an area which has a heavy cover of brush and grasses."

Drainage Studies - E. G. Diseker, Raleigh, N. C.

"Mr. Roy Beck, local Soil Conservation Service technician of Carteret County, headquartered at Beaufort, accompanied the writer to the open ground located about 18 miles northeast of Beaufort. This large area of organic soil, 40,000 acres of which belongs to Miss Georgia P. Yeatman, is somewhat of a reclamation project. Approximately 30 years ago this area was partially drained by a series of ditches 1/4 mile apart and 1 mile long. Within the past several months a number of Soil Conservation Service employees, including the writer and others, visited the area and made recommendations for drainage, water control, and for the establishment of pastures. Recently, a great number of small dragline ditches have been placed between the 1/4 mile ditches, which now gives a ditch spacing of 1/8 mile, and control gates have been installed. From observations thus far it appears that ample

drainage will be provided for pasture, but it is believed that oxidation and subsidence of the organic soil will be rather rapid. Test wells will be installed in this area within the near future."

Drainage Studies - C. B. Gay, Fleming, Ga.

"Duplicate permeability sample sites were located on Bladen very fine sandy loam (plot 3) on which fescue and ladino clover have been growing for 2 years and duplicate sites were located on the identical soil condition across the road (plot 7) which has been cleared for 2 years but not plowed. Samples were collected from each of these four sites from the surface to a depth of 3 feet and percolation without tension was run. The data are as follows as shown in the table below:

Table 1.--Permeability determinations on Bladen very fine sandy loam
Percolation in inches per hour

Location	Site sample No.	Depth of sample 1"-5"	7"-11"	19"-23"	31"-25"	Use
Plot 3	4	1.42	1.00	0.41	0.04	2 yr. old
"	5	.70	1.15	.81	.33	Fescue and
Average		1.06	1.07	.61	.19	Ladino clover
Plot 7	6	.18	.87	.18	.01	Cleared 2 yrs.
"	7	.35	1.10	.50	.38	but not plowed
Average		.26	.98	.34	.19	

"The results reveal that the 2 years of grass and clover has increased the percolation rate of water four times in the top 6 inches with some increase in the 7-11 inch and 19-23 inch zones, and none in the 31-35-inch zone. Very few of the clover roots and no grass roots have penetrated to a depth of 30 inches. The data also reveals that the pore space and volume weight have improved likewise."

Sedimentation Studies - R. Woodburn, State College, Miss.

"It was suggested by Mr. Bailey that some thought be given to in-Service publication of some of our sedimentation material. Accordingly, a manuscript was prepared for a Regional research release entitled, 'Sediment Production Rates from North Mississippi Gullies.'

"On May 8 Mr. Burford took samples of bed material from several wide flat sand bottom channels of bluff line streams as follows: Upper Abiaca, Coila, and Pelucia Creeks, bluff line samples on Abiaca and Delata samples on Pelucia. Delta samples on Abiaca and bluff line samples on Pelucia had already been taken. Table 1 on the next page shows the grain-size distribution of these sand samples, including D_{65} and D_{35}. This analysis is the starting point for any sediment-transport calculations.

"During the month Mr. Burford and I reactivated the work on sediment-transport calculations for some bluff-line streams. This work has been laid aside for the past year due to the pressure of other activities, but it now seems desirable to

Table 1.--Grain-size distribution of bed sand - two bluff line streams

N. B. S. sieve No.	Larger than No. 20	Pass No. 20. ret. No. 30	Pass No. 30. ret. No. 40	Pass No. 40. ret. No. 50	Pass No. 50. ret. No. 70	Pass No. 70. ret. No. 100	Smaller than No. 100	D_{65}	* D_{35}
Representative grain size (mm)		0.71	0.495	0.351	0.248	0.175			
	Percent	Percent	Percent	Percent	Percent	Percent	Percent		
Sample Location									
ABIACA CREEK									
(1) Hy. #17 Bridge	0.10	0.10	0.97	22.07	58.01	13.47	5.27	0.278	0.230
(Coila Creek) Bridge	.67	.36	2.00	29.48	47.82	12.84	6.83	.290	.233
(2) Bluff Line (at Bridge)	.81	1.08	6.03	45.58	35.22	9.09	2.18	.340	.265
(3) Hy. #49E	.05	.29	5.12	54.17	27.90	7.38	5.06	.350	.305
PELUCIA CREEK									
(1) 100' above Hy. #17	.56	2.99	19.54	39.08	25.73	9.24	2.84	.375	.285
(2) 200' below Airbase Bridge	.20	.50	8.81	50.65	30.45	7.74	1.64	.340	.255
(3) 2 mi. E. Hy. 49E	.05	.05	2.14	51.84	31.94	8.96	5.02	.335	.263
(4) 300' above Bridge #49	0	0	.10	4.40	65.52	17.52	12.46	.250	.215

*D_{65} - Grain diameter for which 65 percent of sample is smaller.

D_{35} - Grain diameter for which 35% of sample is smaller.

Used in sediment transport function.

Location 1 - in hills
2 - near bluff line
3 - in Delta
4 - in Delta

return to it.

"For training purposes, a flat sandbed channel 50 feet wide was used with the following grain-size distribution:

0.70 mm - 0.0023 ft. - 6.38%
.495 mm - .00162 ft. - 21.65%
.351 mm - .00115 ft. - 36.08%
.248 mm - .00081 ft. - 25.33%
.175 mm - .00057 ft. - 6.67%

Channel slope - .00181
K_s or D_{65} = .00133 ft. = .405 mm
D_{35} = .00100 ft. = .305 mm

"It was found that bed material transport of all the five above grain sizes was equal to 294,247 tons per year on the basis of the synthetic flow duration curve used and assuming no bank friction. It is impossible to go into details of this complex calculation at this time but it appears of interest to report that if a rough vertical wall on each side of the 50 ft. wide channel were assumed to be equal to a Manning friction of 0.050 then transport for the year with the same flow duration curve would be reduced to 46,695 tons.

"Now, let us assume that by dams and controlled outlets or by some other means we reduce all peaks of flow above 1,500 c. f. s. by about 30 percent. The low flows would be somewhat greater so that the annual runoff of the 15.3-square-mile watershed would be the same as before or 19.6 inches. In this case, the annual transport is reduced from 46,695 tons to 31,245 tons.

"The figure of 46,695 tons per year on the basis of the higher flow-duration curve may be a rather sensible figure and certainly not too excessive. This tonnage of sand for a watershed area of 15.3 square miles (Thompson Creek) and assuming 300 tons of sand per acre per year would equal the sand yields from only 155.65 acres of gullies or 1.59 acres of gully per 100 acres of drainage area. It is believed that the gully percentage may be in excess of 1.59 percent of watershed area.

"This extremely interesting study will remain of high priority with us for some time. It is hoped that sediment samples may be gradually accumulated for higher flows and the sediment density correlated with calculated density for the same stages."

IRRIGATION ENGINEERING AND WATER CONSERVATION DIVISION

Krilium Percolation Tests - E. S. Bliss, Bakersfield, Calif.

"Preliminary tests of the effects of Krilium soil conditioner on percolation rates of soil in small percolation tubes have been going on for over a month. These tests are designed in part to guide field tests to be made in the f[illegible]ture. Under the conditions tested (small tubes, several soil types, continuous flooding)

(a) Krilium added directly to water at a rate of 0.1 percent by wt. of soil within 24 hours reduced percolation rate to zero in a loamy fine sand, fine sandy loam, and a silty clay loam. After 12 more

days of flooding (conclusion of the run) most of the tubes had recovered to about 50 percent of the rate of the control tubes.

(b) After above tubes were shut down and partially dried they were re-run 3 weeks. Percolation rates were approximately twice as high in Krilium treated silty clay loam tubes as in control tubes, about 15 percent higher in the fine sandy loam and about equal in the loamy fine sand.

"This experiment will be repeated with additional soils and more replicates. If it is found practical to add the Krilium to the water instead of incorporating it in the soil an important saving could result.

(c) Krilium was mixed with dry soil (a sandy clay loam, a sandy loam and a shattered hardpan soil which analyzed a sandy loam also) then packed in tubes. When flooded all Krilium tubes showed percolation rates much lower than controls. The sandy loam soil was shut down in 24 hours, partially dried, again wet 24 hours and dried in an oven at 50 degrees C. to the air dry moisture content. The other two groups of tubes have been continuously flooded for 30 days with no drying. Table 1 summarizes the data obtained on these tests thus far:

Table 1.--Comparative percolation rates on three soils treated with Krilium

Soil	Treatment	Percolation rate - c.c./hr.			
		1st day	5th day	15th day	30th day
Sandy clay loam	0.1% Krilium (0.1% wt. of soil) mixed w/air dry soil then packed into tubes	7	48	120	64
Sandy clam loam	Control - no treatment	28	50	32	21
Shattered hardpan (S.L.)	0.1% Krilium mixed w/air dry soil, then packed in tubes	1	1	0	95
Shattered hardpan(S.L.)	Control - No treatment	25	34	69	28
Sandy loam	0.05% Krilium mixed w/air dry soil then packed in tubes. Wetted 24hr., dried 5 days, wet 24 hrs.,oven dry at 50 C. to air dry, then start.	Orig.wetting 20	First day after final drying 125	5th day 300	10th day 151
Sandy loam	Control - no Krilium. Same wetting and drying as above.	45	60	130	90

Lettuce Tillage Experiment - K. Harris and H. B. Peterson, Phoenix, Ariz.

"Core samples were taken and infiltration rates determined during the season on plots of a lettuce tillage experiment conducted at the Mesa Experiment Farm. The following are results of these tests:"

Date of sampling	Depth in inches	Treatment	
		Double disk, float, plant	Plow, plant
		Infiltration Rate- In./Hr.	
Mar. 11, 1952	2-5	0.04	0.24
	6-9	.16	.39
	12-15	4.20	3.70
May 12, 1952	2-5	.03	.18
	6-9	.14	.32
	12-15	4.20	3.90

Hydraulic Tests on Barrel Valves for Use as Irrigation Outlets to Concrete Pipe Lines - V. E. Hansen, Logan, Utah

"Several farmers in Box Elder Valley in northern Utah have installed concrete irrigation distribution systems which utilize barrel valves as the outlets for the water from the distribution system to the surface of the ground. The risers generally consist of iron pipe grouted into the top of the concrete pipe line. At the top of the riser which is usually at about ground surface, a barrel valve is connected by use of a standard pipe coupling.

"At the request of Operations of the Soil Conservation Service, the Irrigation Division conducted tests to determine both the permissible static pressure on the valves and the discharge from the valves when in use as irrigation outlets.

"From table 1, which shows the results of the static pressure tests which were summarized in a preliminary manner for the March monthly report it will be seen that the leakage becomes more serious as the size of the valve increases. This is because of the area upon which the given pressure acts increases as the size of the valve increases. Even though the larger size valves have heavier plate springs, the increased spring tension is not enough to compensate for the increased total pressure, against the plate. From the table it can be seen that no leaking occurs on the 3/4-inch valve at 25 psi. For the 1-1/2-inch valve, no leakage occurs at 19 psi, but for the 1-1/2-inch and 2-inch valves, 10 psi is about the maximum pressure that can be applied to the valves without causing the valves to leak. Since most concrete pipe lines are installed for maximum pressures of less than 10 psi, the larger size valves will probably operate satisfactorily without leakage on most concrete pipe lines.

"The discharge of these valves under various operating pressures is presented in table 2. (Both table 1 and table 2 will appear on the next page.) Since the losses which occur at the entrance to the riser, and the losses in riser and in the valve are all functions of the discharge, the data shown in the figure, copy of which can be obtained from the project, is in terms of the main line pressure.

Table 1.--Static pressure and leakage tests for barrel valves

Valve size (inches)	Pressure in main line (#/sq.in.)	Leakage in g.p.m.
2	9	No leakage
	14	0.01
	19	.09
	25	.60
	Started to drip at 14 psi.	
	Started to run down pipe at 22 psi.	
	Started to spray at 23 psi.	
1-1/2	9	No leakage
	14	100 drops per minute
	19	0.005
	25	0.01
1-1/4	19	No leakage
	25	200 drops per minute
3/4	25	No leakage

Table 2.--Discharge of barrel valves when installed as irrigation outlets. Pressure head measured at outlet from main line with 2 feet of riser between main line and valve.

Pressure head, feet of water	Discharge, g.p.m.			
	3/4" valve	1-1/4" valve	1-1/2" valve	2" valve
5	9	31	60	90
10	15	53	103	150
15	20	69	135	
20	24	82		
25	27	94		
30	29			

Hence, from the figure, it can be seen that the 3/4-inch valve will discharge approximately 20 gpm when the pressure head in the main line beneath the valve is 15 feet of water. These data apply to an installation with 2 feet of riser the same size as the valve to connect the valve to the main line. The pressures are in terms of the main line pressure to make the data more readily usable by the designing engineer.

"Since the valve produces a very definite jet, serious erosion will occur unless positive steps are taken to dissipate the energy of the jet before it strikes the soil. It is reported in the Box Elder Area that some of the farmers are eliminating this difficulty by use of a short length of concrete pipe. It is quite definite from the characteristics of the jet that a barrel valve cannot be used to distribute irrigation water unless provisions are made to prevent erosion by the jet."

How to Start Alfalfa - S. J. Mech, Prosser, Wash.

"Results from the alfalfa established last year under three ranges of soil moisture are arousing so much attention that we contemplate extending the test through the year.

"The alfalfa was seeded in dust in wheat stubble on August 6, 1952, and 'irrigated up' immediately afterwards. Subsequent irrigations were made only when the available soil moisture in the 4-foot root zone dropped to 60 percent, 35 percent, and 15 percent on the wet, medium, and dry plots respectively. The dry plots did not require any more irrigation that season and on October 30 had a soil-moisture content of 11.1 percent. The medium plots were irrigated again on October 2 and ended the month of October with a moisture content of 14.8 percent. The wet ones, irrigated on September 5 and 26 had a moisture content of 14.9 percent on October 29. All measurements are averages for a 4-foot depth.

"Observations last fall and early this spring has shown that the alfalfa on the dry plots is as good or better than that on the other ones. A short time ago seven technicians from the Irrigation Experiment Station were asked to judge the quality of the stand on the three treatments. The dry plots were judged the best and the wet ones were the poorest.

"The stand even on the wet plots was satisfactory, but it is less uniform than either the medium or the dry.

"These observations pose a very perplexing question--why should the best stand be on the treatment which no one would recommend--and the poorest stand occurs where the universally recommended practice was followed?

"Whether August is the best time to start alfalfa or whether it should be seeded with the wheat or in the stubble are questions outside of the immediate study. Our objective was to measure the influence of different irrigation management (influence of soil moisture) in starting alfalfa. No one will deny that a seeding on August 6 provided a severe test especially for the dry plots. Yet in spite of all these handicaps, the 'severest' treatment showed up best."

Study of Seepage in Irrigation Channels - C. Rohwer, Ft. Collins, Colo.

"This study indicates that time is one of the most important factors that influences the seepage rate. From June 1950 to November 1951, the loss from sandy loam decreased from 4.4 cubic feet per square foot per day to 0.3 cubic foot. The

loss from clay loam decreased from 24.5 cubic feet per square foot per day in June 1950 to 1.1 cubic feet in November 1950. The loss from heavy clay decreased from 0.31 to 0.02 cubic foot per square foot per day from June to November 1951.

"Measurements of seepage losses with various types of permeameters installed in the seepage rings show that these devices are reasonably accurate, if the averages of readings at different locations in the seepage rings are used. In sandy loam soil the average rate measured with the SCS seepage meter was 0.372 cubic foot per square foot per 24 hours and with the USBR seepage meter was 0.500. The actual rate during the time these tests were made as shown by the seepage rings, was 0.400. Similar measurements in heavy clay were 0.046 for the SCS meter, 0.025 for the USBR meter and 0.043 for the seepage rings. Although the seepage rate from sandy loam was 10 times that from heavy clay the seepage meters were reasonably accurate in both types of soil."

Irrigation on the High Plains of Texas - N. P. Swanson, Amarillo, Tex.

"Irrigation applications of 6.4 inches were made on plots of Madrid sweetclover on the Amarillo Conservation Experiment Station starting on May 8. The 0 to 2 foot zone was near the wilting point at the time of irrigation. Rain totaling 0.72 inch was received on May 10. There was no runoff and little loss by evaporation in the dense growth of clover. The surface soil remained about field capacity for 7 days after irrigation and moisture penetration to a depth of 30 inches was obtained. (The available moisture storage in the 0 to 30-inch depth is 5.9 inches.) It has been demonstrated again that good distribution and a high irrigation efficiency can be obtained on these silty clay loam soils (Land Capability Unit II - 2 HP) with moderate applications of water, but that in their present structural condition it is not feasible to apply enough water to fill the soil-moisture reservoir (11.8 inches of available water in the 0- to 6-foot depth) in one irrigation application even with a good vegetative cover."

Irrigation Studies - P. E. Ross, Weslaco, Tex.

"Rains during the latter part of May have alleviated the drought conditions in the Lower Rio Grande Valley of Texas. The watershed of the Rio Grande River has also received rains which have produced a good flow in the River. While the rains are too late to produce crops on unplanted areas, they are very beneficial to the growing crops.

"The alfalfa plot of the H. J. Garrett farm was irrigated on May 7. The average soil-moisture content of the first 3 feet of the soil was 9.2 percent at the time the irrigation water was applied. This is below the average wilting point of the soil and consequently the alfalfa had been in very poor condition for a few weeks before the irrigation was applied. A total of 9.43 inches of water was applied and held on the area. Of the total amount applied 93.7 percent was held in the first 3 feet of the soil. Below is the average inches found added to each foot.

Depth	Inches of water added
0-1 foot	3.23 inches
1-2 "	2.82 "
2-3 "	2.69 "
3-4 "	.67 "
4-5 "	.30
Total inches found	9.71

"The efficiency calculated from this shows 103.0 percent. Such an efficiency, of course, indicates lack of uniform distribution. The lack of uniform distribution is believed to be caused by the difference in the rate at which the water is taken into the soil at various places within the border. The soil is a silty clay and does not crack badly upon drying. However, enough cracking probably did occur to cause varying intake rates.

"The rate of intake of the water into the soil was measured and the following results were obtained:

Irrigation began at 10:47 a. m. and water had covered the entire pan at 12:05 p. m. or in 1 hour and 18 minutes. The irrigation was completed at 12:47 p. m. and the water had leveled out by 1:00 p. m. and was 5.7 inches deep over the entire plot at that time.

"This indicates that 3.73 inches had entered the soil in 2 hours and 13 minutes, giving an average intake rate of 1.67 inches per hour. The intake rate was measured periodically after the water had leveled out and the following results obtained.

	Time	Hours	Drop in water level Inches	Intake rate Inches/hr.
May 7	1:00 p. m. to 2:36 p. m.	1.6	0.6	0.375
	2:36 p. m. to 5:00 p. m.	2.4	.6	.250
	5:00 p. m. to 7:00 p. m.	2.0	.4	.200
May 8	7:00 p. m. to 9:36 a. m.	14.6	2.0	.137
	9:36 a. m. to 4:00 p. m.	6.4	1.1	.172

"The remaining 1 and 1/2 inches entered the ground during the night of May 8.

"Considering the initial rate of 1.67 inches per hour while the water was being applied and the rate after application an average rate of 0.29 inch per hour was obtained.

"This compares with the intake rate of 0.25 inch per hour on the irrigation 2 months before. The average intake rate after the water had leveled off was 0.158 inch per hour on the first irrigation and 0.172 on the second irrigation.

"The head of water used on this level pan 57 feet wide and 637 feet long averaged 3.96 c. f. s. The travel time required for the water to reach the lower end was 1 hour 18 minutes, giving an average velocity of 12.2 feet/minute. The slope of hydraulic gradient of the advancing head for the irrigation of May 7 and March 5 is given below:

	May 7 irrigation Percent	March 5 irrigation Percent
First 100 feet	0.33	0.55
Second	.25	.40
Third	.29	.30
Fourth	.32	.35
Fifth	.21	.35
Sixth	.18	.33

"Since the alfalfa was greener and leafier on March 5 than it was on May 7, it is not surprising that the resistance to the traveling head was greater on March 7."

Surface and Sprinkler Irrigation Studies - W. D. Criddle, Boise, Idaho

"Irrigation was begun during early May and about 8 to 9 inches depth of water was applied to each clover plot at the Black Canyon Experiment Station in two irrigations. Although this amount of water is more than adequate to meet the requirements of the crop, the 'slick spot' areas did not absorb sufficient water to maintain vigorous growth of clover.

"Intake rates as measured by ring infiltrometers show a slight increase over tests made at the same locations last fall. The average rate is about 0.25 inch per hour in the normal soils. Although it is slow even on the normal soils, the slick spots absorb water at a much slower rate. If some means can be found for making the intake rates of the entire fields uniform, then adequate irrigation will be possible. Unless this can be done, there will always be over irrigation of some parts of the field and under irrigation of other parts."

Rice Irrigation Experiments - D. W. Bloodgood, Austin, Tex.

"A meeting was held at the Beaumont Rice Experiment Station and we discussed from a research viewpoint the irrigation studies to be carried on during the 1952 season. As a result of this conference we decided to carry on some research studies by using 6' x 20' metal tanks to carry on some research studies in connection with the irrigation of rice. Five of these tanks were installed during the month, and most of the equipment was provided for the studies. The tanks were also seeded. A plan of irrigation treatments, percentage of stand (both weeds and rice), various depths of submergence, thinning of weeds for one-half of the tanks as compared to weeds and rice, fertilizer treatment, temperature or water for various depths of submergence to control weeds, and other factors pertaining to the studies will be prepared by the secretary for the Experiment Station.

"All of the concrete flumes, with the exception of two, have been installed for the eight experimental fields. Due to the heavy rainfall, only two fields have been seeded at the end of the month. An anemometer and a rain gage have been installed in the vicinity of the fields for rainfall and wind-movement records that will be used in connection with the plot studies."

Snow Surveys and Irrigation Studies - C. E. Houston, Reno, Nevada

"High elevation snow started moving off the Sierra Nevada during May. Farm days, cool nights, and no precipitation have been ideal for controlled runoff. The Humboldt River flooded much of the lowland during the month. In many areas this condition was considered a good irrigation, while in others there was some washout of ditches and headgates. Cropland at the lower end of the river is being encroached upon by backwater from Humboldt Sink. There will probably be more water entering the Sink this year than ever before recorded. Accompanied by the Assistant State Engineer, Ed. Muth, and Humboldt Water Commissioner, George Hennen, a flight was made over the headwaters of the Humboldt to appraise the snow conditions with respect to estimating which streams had peaked and which remained to peak.